

# Work Order ID 74665

Wednesday, October 05, 2011 8:24:22 AM



**U/R**

Page 1

Item ID: D350-748-101

Accept



Setup Start



Revision ID: ~~U/R~~

Stop



Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 10/21/2011 Req'd Qty: 1.00

Customer:

Reference:

Run Start



Approvals: Process Plan: M.L.S Date: 11/10/05 Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

D350-748-141

U/R OK 11.12.05

100

0.00



DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile & type labels per PPPD350-748-101 CHG002

11 12 02 (1)  
for M.L.S 11-12-2

110

0.00



BENDING MACHINE - CROSSTUBES

CNC Bend 1

Memo

0.00

CNC Delta 100 Bender

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT \_\_\_\_\_

11-11-9

120

QC15- Crosstube Dimensional Check

0.00



QC

Memo

0.00

Quality Control

Sululu



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125  HandFXtube	<b>Memo</b> ***Stress relief*** Heat treat crosstube as per QSI010 4.3 Temp: <u>375</u> Start time: <u>4h45</u> Finish time: <u>8h45</u>	0.00				<u>(2)</u>			
Hand Finishing Crosstubes		0.00							
127  QC	QC6- Inspect dimensions to drawing  <b>Memo</b>	0.00							
Quality Control		0.00							

*SPD 11-11-09*

*8/11/10*

W/O:		WORK ORDER CHANGES					
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Page 3

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Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130		0.00							
	Crosstubes								
Crosstubes	<b>Memo</b>	0:00							
Crosstubes	1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs, Set-up drill table as per QSI 010								
	2-Deburr								
	3-Engrave Part # and Batch # as per Dwg D350-748-141								
	4-Remove all marks from tube within limits of D350-748-141								
	5- Apply a light coat of LPS3 on the interior of tube Batch: <u>m 109956</u>								
140	QC5- Inspect part completeness to step on W/O	0.00							
QC	<b>Memo</b>	0.00							
Quality Control	CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)								

*Handwritten:* JT 11-11-10

*Handwritten:* JW 11-11-14  
MO 11-11-15

*Handwritten:* Su 11/11/15

W/O:		WORK ORDER CHANGES					
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Page 4

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--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00



Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 15462  
Stress relief at 375° for 5 hours  
Magnetic Particle Inspect per ASTM E1444  
Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2  
Embrittle relief at 375° for 8 hours, Chromate Treat  
Possible Supplier: Southwest United Industries  
Ensure Certificate of Conformity is attached

11/11-15

160

Receive & Inspect for Damage & Mat'l Certs

0.00



Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

170

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

★ SEE WID CHG ATTACHED

POSITIVE RECALL

EFFECTIVE 11.10.05 AUTH CP 21 11 30

RELEASED 11/2/02 DATE 11/2/02 hard testing / not done

11/2/05

CP

11/11/30  
11/11/30 RO

161/162

W/O:		WORK ORDER CHANGES					
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Dart Aerospace Ltd

W/O: 74605

# WORK ORDER CHANGES

DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
11.10.05	161	LOAD TUBE TO 3500 <sup>lb</sup> FOR 1 MINUTE. REF D.S. EMAIL.	CP	11.11.29		CP 11.10.05 PS1042	11.11.29
11.10.05	162	NDT TUBE.	W	11.12.02		CP 11.10.05 PS1042	11.11.29

Part No: D350-748-10 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries

## Kim Johnston

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**From:** Chris Provencal <cprovencal@dartaero.com>  
**Sent:** Wednesday, October 05, 2011 10:07 AM  
**To:** Johnston, Kim  
**Subject:** FW: 350 crosstubes

Can you print this.

**From:** David Shepherd [mailto:dshepherd@dartaero.com]  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

W/O:		WORK ORDER CHANGES					
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Page 5

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Cust Item ID:

Required Date: 10/21/2011 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

180



SprayPaint

SprayPaint

0.00

Memo

0.00

Spray Painting

1-Prime inside crosstube as per QSI 005 4.2  
2-Prime Outside of Tube as per Dart QSI 005 4.2

25 11 - 11 - 30

190



QC

Quality Control

QC14- Inspect Spray Paint

0.00

Memo

0.00

Then, Wrap in plastic bag to protect from scratches

11 - 12 - 01

200



Crosstubes

Crosstubes

Crosstubes

0.00

Memo

0.00

1-Install Ground wire Insert, then insert screw and washer

2-Install Abraison strips as per Dwg D350-748-141 &amp; QSI 035.

3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS

25 11 - 12 - 02

W/O:		WORK ORDER CHANGES					
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Page 6

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Required Date: 10/21/2011 Req'd Qty: 1.00

Customer:




Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
210  QC Quality Control	QC5- Inspect part completeness to step on W/O  Memo	0.00  0.00				<u>11</u>	<u>11</u>	<u>12</u>	<u>02</u> ①
220  Packaging Packaging	Pick Kit  Memo	0.00  0.00							<u>SP 11-12-02</u>
230  QC Quality Control	QC4- 100% Inspect kits for completeness  Memo	0.00  0.00				<u>11</u>	<u>11</u>	<u>12</u>	<u>02</u> ①

W/O:		WORK ORDER CHANGES					
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Page 7

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Customer:

Reference:

Run Start



Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: <u>102</u>								
	PPP Rev: <u>C</u>								
250		0.00							
	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

11/12/08

11/12/08

R11-12-2  
①161 ISSUE PO 15585  
Liquid Penetration

R11-11-30

W/O:		WORK ORDER CHANGES					
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# Picklist Print

Page 1

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Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011

Required Date: 10/21/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
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D350-748-141TRN Manufactured No

110

Each

3.0000

1

1



Crosstube Turning Detail

Location

Loc Qty

Loc Code

LG

3

72812

1

72815

1

72817

1

ALS4-1032-225

Purchased

No

73580

200

Each

1,852.000

1

1



Insert

Location

Loc Qty

Loc Code

ST282

1852

110768

62

118386

860

118966

930

AN960JD10

NAS1149D0363J

Purchased

No

200

Each

0.0000

1

1



Washer

119537

① DP 11-11-9

BT 11-12-02

x1

BT 11-12-02

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Start Date: 10/5/2011

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Start Qty: 1.00

Required Qty: 1.00

D2856-400

Manufactured No

200 f

373.3845

1.181

1.243158



Abraison Strip



11-12-02

Location

Loc Qty

Loc Code

ST403

0.3149

68076

0.3149

ST409

373.0696

63735

0.6696

71164

156.4

73491

216

x 1.2432

D3502-1

Manufactured No

200 Each

63.0000

2

2



Support



11-12-02

Location

Loc Qty

Loc Code

ST063

63

61206

7

64004

10

68951

12

72129

14

73419

20

x 2

MS21920-20

Purchased No

200 Each

62.0000

2

2



Clamp (per MIL-DTL-8783C)



11-12-02

Location

Loc Qty

Loc Code

LG050

62

116799

10

118236

6

118649

46

x 2

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Required Date: 10/21/2011

Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

215.0000

1

1



Screw

119307



85 11-12-02

Location

Loc Qty

Loc Code

ST290

15

117441

15

ST291

200

118612

200

Purchased

No

220

Each

309.0000

8

8

AN4-41A



Bolt



SP 11-12-02

Location

Loc Qty

Loc Code

ST360

309

115108

34

115705

50

116191

50

117619

50

117795

25

118451

50

118838

50

8x

W/O:		WORK ORDER CHANGES					
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Page 4

Wednesday, October 05, 2011 8:24:40 AM

Work Order ID: 74665

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011

Required Date: 10/21/2011

Start Qty: 1.00

Required Qty: 1.00

AN4-6A

Purchased

No

220

Each

6,236.000

16

16

Bolt

## Location

## Loc Qty

## Loc Code

ST356

1230

117872

30

118422

300

118628

400

118838

300

119127

200

ST358

6

117514

6

ST516

5000

119017

5000

AN5-32A

Purchased

No

220

Each

183.0000

4

4

Bolt

## Location

## Loc Qty

## Loc Code

ST339

75

118628

50

118983

25

ST340

108

117872

58

118422

50

AN960JD416

NAS1149D0463J

Purchased

No

220

Each

0.0000

32

32

Washer

AN960JD516

NAS1149D0563J

Purchased

No

220

Each

0.0000

8

8

Washer

Wednesday, October 05, 2011 8:24:40 AM

Shop Packet Print

Page 4

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Wednesday, October 05, 2011 8:24:40 AM

Work Order ID: 74665

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011

Required Date: 10/21/2011

Start Qty: 1.00

Required Qty: 1.00

WJ  
X1

D3500-1



Saddle

Manufactured No

220 Each

28.0000



4

B73407 SP.

Location

Loc Qty

Loc Code

ST424

21

66127

9

68947

12

ST424/25

7

62207

7

220 Each

245.0000




16

B73391 SP.

WJ  
X1

D3501-1



Bushing

Manufactured No

Location

Loc Qty

Loc Code

ST063

202

68939

102

70682

100

ST066

43

67757

43

220 Each

14,709.00




24

SP 11-12-02

WJ  
X1

MS21042L4



Nut

Purchased No

Location

Loc Qty

Loc Code

ST300

3709

117441

51

117601

637

117885

21

118451

2000

118927

1000

ST516

6000

119017

6000

ST518

5000

119075

5000

24X

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Wednesday, October 05, 2011 8:24:40 AM

Work Order ID: 74665



Parent Item: D350-748-101



Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011

Required Date: 10/21/2011

Start Qty: 1.00

Required Qty: 1.00

MS21042L5

Purchased

No

220

Each

2,684.000

4

4

Nut

Location

Loc Qty

Loc Code

ST300

1184

116105

5

116548

53

117441

248

117611

82

118179

496

118910

300

ST518

1500

119109

1500



SP 11-12-02

4x

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

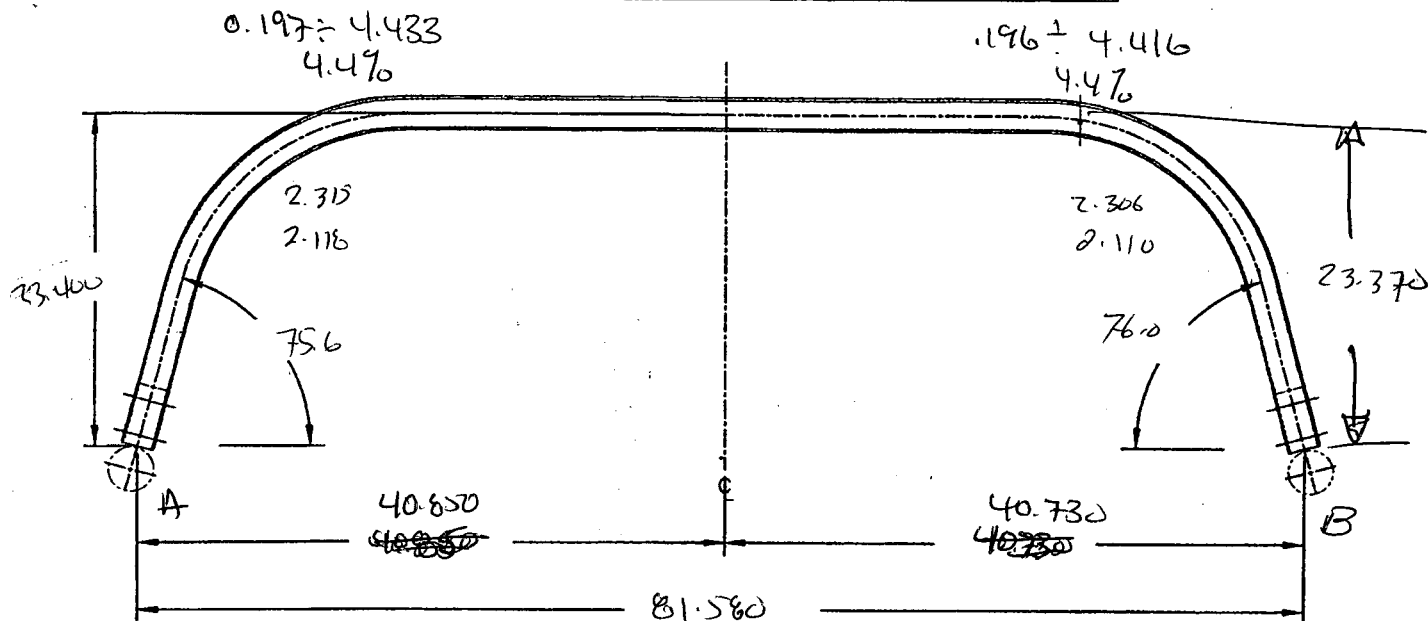
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NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	74665
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments	
Twist = 0.130	
Side A = 4.4% @ 41 Passes	
Side B = 4.4% @ 40 Passes	
Bent high. Acceptable. @ 11.1.10 @ 1.6m	

QC15 Inspection	Σ
Date	11/11/10

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

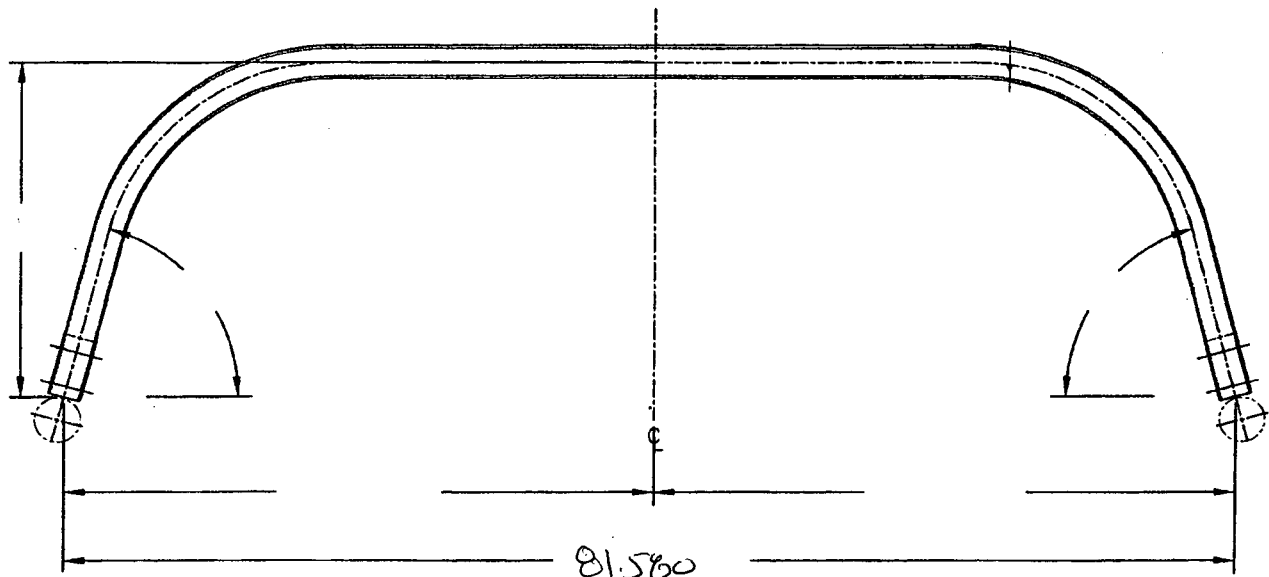
**NOTE:** Date & initial all entries



<b>DART AEROSPACE LTD</b>	<b>Work Order:</b>	
<b>Description:</b> Crosstube High Fwd (AS350/355)	<b>Part Number:</b>	<b>D350-748-101</b>
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> F		<b>Page 1 of 1</b>

*For stress relief only*

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
<i>twist = 0.130</i>

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	<i>[Signature]</i>



Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT

WITHOUT NOTICE  
WORK ORDER

NO. 74665 H.L.J

11/10/05

OK 11/10/05  
UNDER REVIEW  
11/16/05

RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		
<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA DRAWING NO. D350-748-141 REV. F SHEET 1 OF 4 TITLE CROSSTUBE (AS 350/355 HI FWD) SCALE NTS COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.			

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

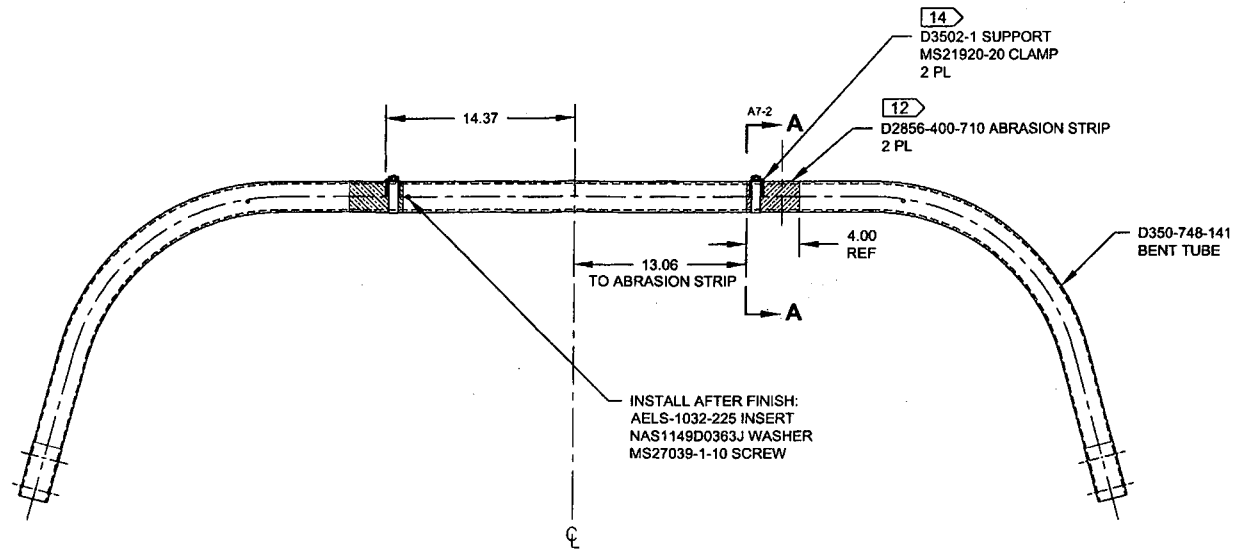
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

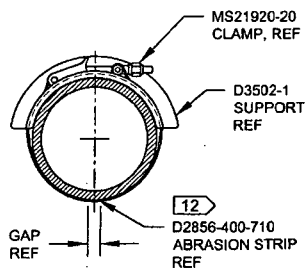
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

74665



**D350-748-141  
ASSEMBLY DETAIL**



**SECTION A-A** D4-2  
SCALE 4X

UNDER REVIEW  
CP 11.07.11

**RELEASED**  
2011-01-28

DESIGN	92	<b>DART AEROSPACE LTD</b>	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. F
MFG. APPR.	92	D350-748-141	SHEET 2 OF 4
APPROVED	92	TITLE	SCALE
DE APPR.	92	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

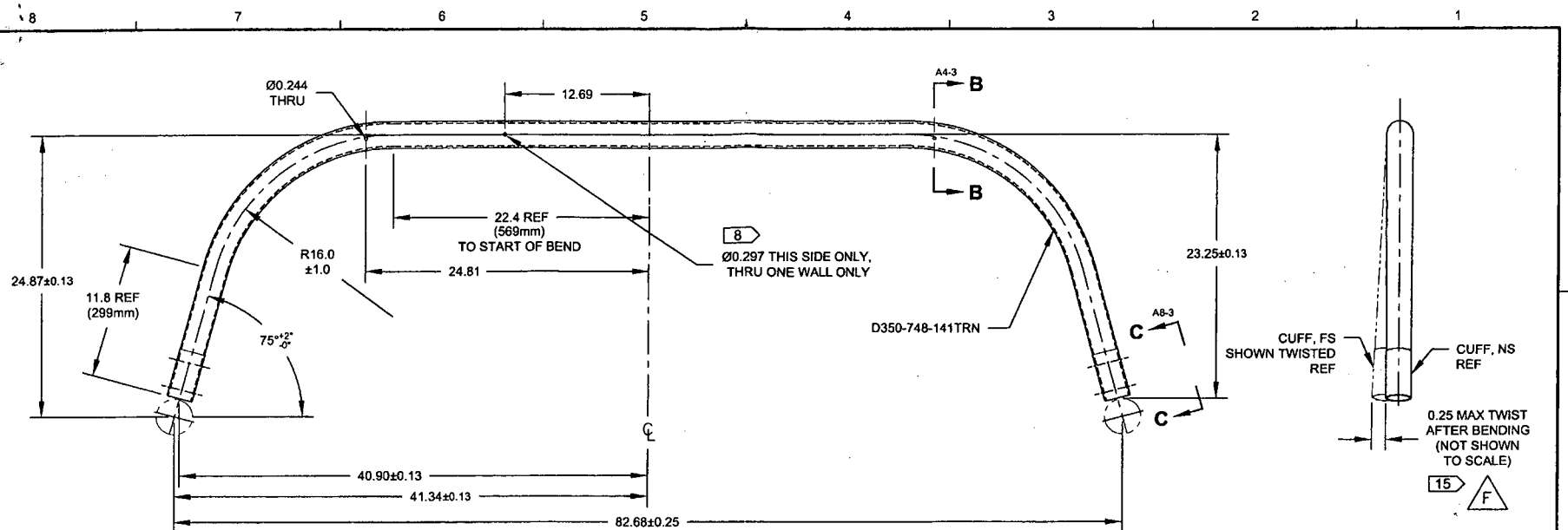
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

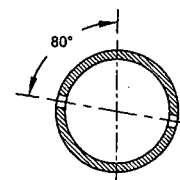
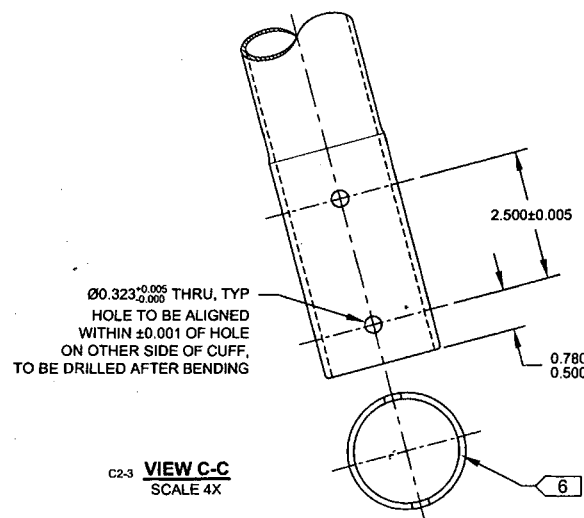
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

74605



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



UNDER REVIEW  
11.27.12

RELEASED  
2011-01-18

DESIGN	QP	<b>DART AEROSPACE LTD</b>	
DRAWN	QP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	h	DRAWING NO.	REV. F
MFG. APPR.	C	D350-748-141	SHEET 3 OF 4
APPROVED	h	TITLE	SCALE
DE APPR.	h	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMERCE OR COMMUNICATION TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

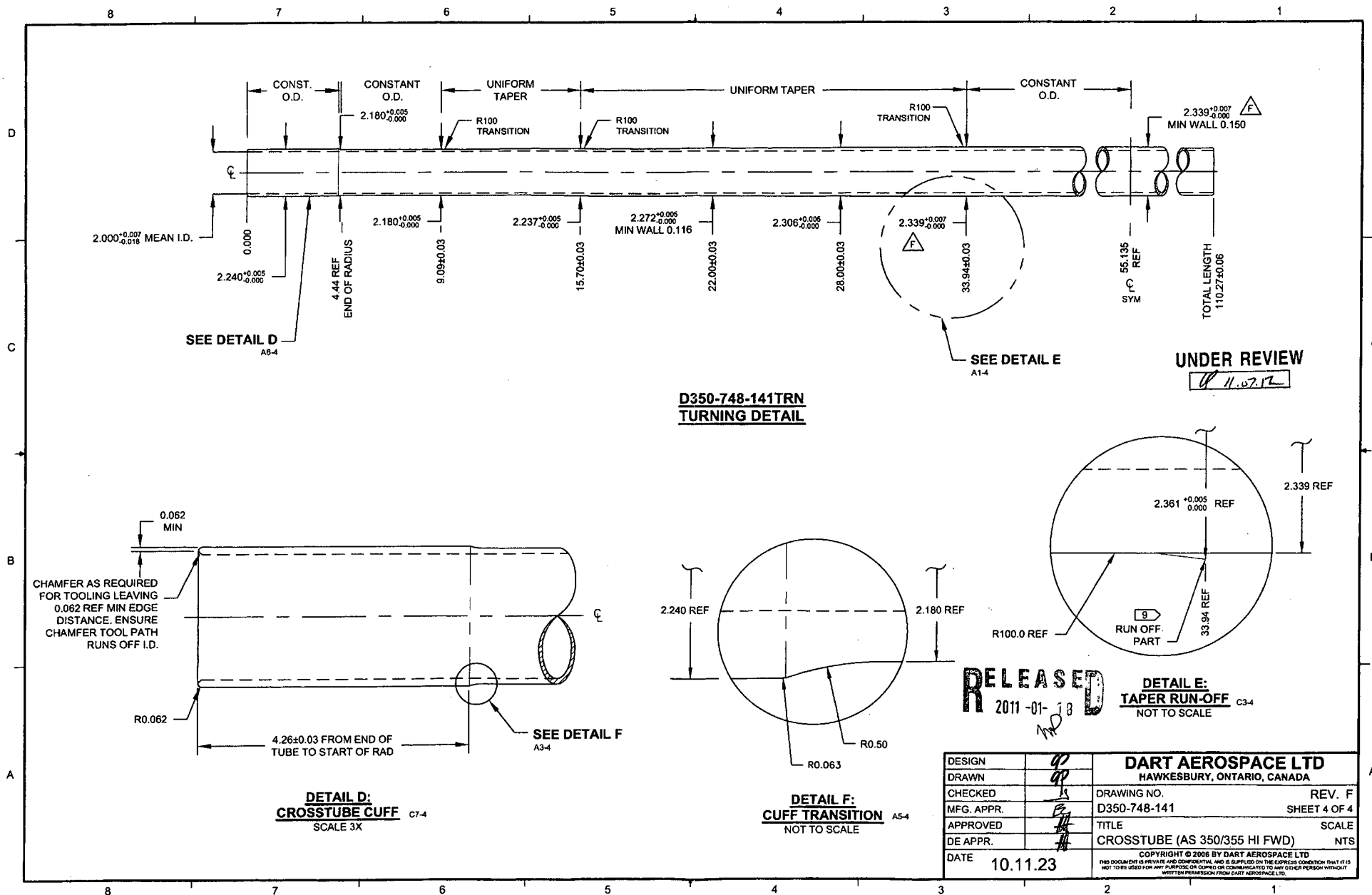
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



74665



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

## 5.0 PARTS LIST

Qty -101	Qty -201	Part Number	Description
X		D350-748-101	CROSSTUBE INSTALLATION, AS 350/355 HIGH FWD
	X	D350-748-201	CROSSTUBE INSTALLATION, AS 350/355 HIGH AFT
1		D350-748-141	CROSSTUBE ASSEMBLY, AS 350/355 HIGH FWD
	1	D350-748-241	CROSSTUBE ASSEMBLY, AS 350/355 HIGH AFT
*2	*2	D3502-1	SUPPORT
*2	*2	D2856-400-710	ABRASION STRIP
*1	*1	AELS-1032-225	INSERT
*2	*2	MS21920-20	CLAMP
*1	*1	MS27039-1-10	SCREW
*1	*1	AN960JD10	WASHER
4	4	D3500-1	SADDLE
16	16	D3501-1	BUSHING
16	16	AN4-6A	BOLT
8	8	AN4-41A	BOLT
4	4	AN5-32A	BOLT
32	32	AN960JD416	WASHER
8	8	AN960JD516	WASHER
24	24	MS21042L4	NUT, (OR MS21042-4)
4	4	MS21042L5	NUT (OR MS21042-5)

\* REFERENCE ONLY. PARTS ARE INCLUDED IN D350-748-141/241 ASSEMBLIES ABOVE

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Revision: **B**

Date: 07.06.15

CERTIFICATE OF  
CONFORMANCE

CADORATH PLATING CO. LTD.  
2160 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1

DATE: Nov-25-2011

CONSIGNEE TO: Dent Aerospace Ltd.

1270 Aberdeen St.  
Hawkesbury, ON K6A 1H7

W/O #: 109698  
INVOICE #: 57840

CONTRACT OR

PURCHASE ORDER# 15462

DESCRIPTION: SKID

QTY 1

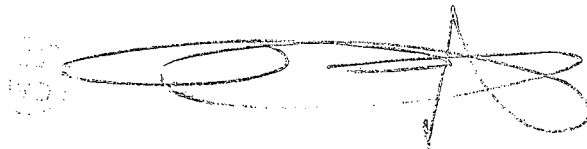
P/N # 3550-748-101

S/N # B74665

STRESS RELIEVE BAKE HEAT CHART #11-1209, MPI IAW ASTM-E-  
1444, CADMIUM PLATE IAW AMS-QQ-P-416C TYPE 2 YELLOW  
CLASS 2, BAKE HEAT CHART # 11-1209.

CERTIFICATE: I certify that the items indicated here on have  
been inspected and tested and conform to all specifications  
and requirements detailed on the contract or purchase order.

Approved Inspector:





# LIQUID PENETRANT TEST REPORT

P- 12241

CLIENT	<u>DART Aerospace</u>	DATE	<u>NOVEMBER 30, 2008</u>	PAGE	<u>1</u> OF <u>1</u>
ATTENTION	<u>CHRYSTAL L.</u>	ACUREN JOB No.	<u>188-11-0795</u>	TIME	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>
ADDRESS	<u>1770 ABELDEEN ST.</u> <u>HAWKES BAY, ON.</u>	PO/VO No.	<u>15424</u>		
		WORK LOCATION	<u>SAME</u>		
PROJECT	<u>F.P.I.</u>	ACCEPTANCE STD.	<u>ASTM 1417/051-038</u>	REV./DATE	<u>2005</u>
ITEM(S) EXAMINED	<u>ON CROSS TUBES.</u>				

JOB DESCRIPTION	PROCEDURE No. <u>LT 2012</u> REV./DATE <u>2008</u>	TECHNIQUE No. <u>LT 2012</u> REV./DATE <u>2008</u>
PART No. <u>SEE RESULTS</u>	MATERIAL <u>ALUMINUM</u>	THICKNESS <u>VARIOUS</u>
SCOPE	<u>A WET FLUORESCENT LIQUID PENETRANT INSPECTION WAS CARRIED OUT 100% EXT.</u>	

TEST DETAILS			
METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH
FAMILY BRAND	<u>UTINA FLUX</u>		<input type="checkbox"/> SOLVENT REMOVABLE
PENETRANT	<u>2L67</u>	MINIMUM DWELL TIME <u>45</u> MIN.	<input type="checkbox"/> POST EMULSIFIED
PENETRANT REMOVER	<u>H2O</u>	MINIMUM DRY TIME <u>&gt;10</u> MIN.	<input type="checkbox"/> BLACK LIGHT S/N <u>16459</u>
DEVELOPER	<u>SKS 32</u>	MINIMUM DWELL TIME <u>10</u> MIN.	<input type="checkbox"/> OUTPUT > 1000 $\mu$ W/cm <sup>2</sup>
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS	<input type="checkbox"/> AQUEOUS	<input type="checkbox"/> AMBIENT < 2 fc
	<input type="checkbox"/> DRY		<input type="checkbox"/> LIGHTING EQUIP. <input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT
			<input type="checkbox"/> OUTPUT > 100 fc @ SURFACE
			OTHER
			LIGHT METER S/N <u>1098866</u>
			CAL DUE DATE <u>FEB 2 2012</u>

TEST SURFACE			
SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input checked="" type="checkbox"/> MACHINED
SURFACE TEMPERATURE	<input type="checkbox"/> < - 4°C/ 20°F	<input type="checkbox"/> - 4°C/ 20°F TO 10°C/50°F	<input type="checkbox"/> SHOT BLASTED
			<input type="checkbox"/> CLEAN BARE METAL
			<input checked="" type="checkbox"/> 10°C/50°F TO 52°C/125°F
			<input type="checkbox"/> > 52°C/125°F

RESULTS- <input checked="" type="checkbox"/> METRIC <input type="checkbox"/> IMPERIAL	
<u>1 CROSS TUBE W.O. 74665</u>	<input checked="" type="checkbox"/>
<u>1 CROSS TUBE W.O. 72231</u>	<input checked="" type="checkbox"/>
<u>1 CROSS TUBE W.O. 75893</u>	<input checked="" type="checkbox"/>
<u>1 CROSS TUBE W.O. 75894</u>	<input checked="" type="checkbox"/>
<u>1 CROSS TUBE W.O. 74329</u>	<input checked="" type="checkbox"/>
<u>1 CROSS TUBE W.O. 74328</u>	<input checked="" type="checkbox"/>

**Scope of Services**  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

**Standard of Care**  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES		
CLIENT REPRESENTATIVE	<u>Ryan Titterton</u>	DTR # <u>E63653</u>
TECHNICIAN (SIGNATURE):	<u>Mike J. Hasker</u>	REPORT REVIEWED BY:
NAME (PRINT):	<u>Mike J. Hasker</u>	NAME INITIALS
CGSB LEVEL <u>II</u> SNT LEVEL <u>II</u>	CGSB LEVEL <u>II</u> SNT LEVEL <u>II</u>	
CGSB REG. NO. <u>6606</u>	CGSB REG. NO. <u>6606</u>	

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY